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ABSTRACT

This report examines education and the economic rewards to education among Hispanic Americans, documenting the gap in educational outcomes for Hispanics relative to non-Hispanic Whites. It also provides evidence about the increasing importance of education to economic success among Hispanics in the new economy, highlighting the high-paying sector of information technology (IT). Significant findings include: the Hispanic population is a rapidly growing, increasingly important segment of the U.S. population; despite tangible evidence of improvements for some groups, there are lags in the educational attainment of Hispanics; the economic rewards of education are on the rise; the relatively low levels of Hispanic earnings are explained largely by lower levels of educational attainment (earnings premiums associated with higher education are much the same for Hispanics as for non-Hispanics); and Hispanics are greatly under-represented in the high-paying IT sector, but in general those in IT occupations are successful. The IT case study illustrates that the consequences of underachievement in education are two-fold: students' future prosperity is harmed, and the economy at large will have fewer individuals prepared to contribute in new economy occupations. An appendix presents descriptions of IT occupations studied in this report. (SM)

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Educational Attainment and Success in the New Economy: An Analysis of Challenges for Improving Hispanic Students' Achievement

June 2000

A Report by
The Council of Economic Advisers

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EXECUTIVE SUMMARY

This report focuses on education and the rewards to education among Hispanics in the United States. It documents the gaps in educational outcomes for Hispanics relative to non-Hispanic whites. The study also provides evidence about the increasing importance of education to the economic success of Hispanics in the new economy, focusing particularly on a high-paying, rapidly expanding sector, information technology (IT). Among the significant findings in the report are:

- *The Hispanic population is a rapidly growing, increasingly important segment of the U.S. population.* In 20 years about 1 in 6 U.S. residents will be of Hispanic origin, and by the middle of this century—when today's young children are middle aged—this ratio will increase to about 1 in 4. The future productivity of the U.S. labor force hinges to a considerable degree on our nation's ability to provide high quality education for Hispanic young people who will play a vital role in the labor market of the future.

- *Despite tangible evidence of improvements for some groups, there are troubling lags in the educational attainment of Hispanics.* Over recent decades the average education of Hispanics born in the United States has increased substantially, and the educational gap between U.S.-born Hispanics and non-Hispanic whites has narrowed. Nonetheless, the high school completion rate among all young Hispanic adults is only 63 percent—compared with 88 percent for whites and African Americans. And the proportion of Hispanics who graduate from 4-year colleges is less than half that of whites. While these differences are partially attributable to the low education levels of immigrant Hispanics, U.S.-born Hispanics also have relatively low educational attainment.

- *The economic rewards of education are on the rise.* The importance of improving educational outcomes for Hispanics is underscored by the increasing value of education in the labor market. Two decades ago, a male Hispanic college graduate earned 67 percent more than a Hispanic male with no high school education, an earnings premium that has increased to 146 percent today. Similar increases in the earnings premium are observed for all employed males.

- *Currently, the relatively low levels of Hispanic earnings are explained in large measure by lower levels of educational attainment. Earnings premiums associated with higher education are much the same for Hispanics as for non-Hispanics.* Hispanics have much lower earnings than non-Hispanic whites; median hourly earnings are 21 percent less for U.S.-born Hispanics. After accounting for differences in age and gender, U.S.-born Hispanics earned 15 percent less, and after controlling also for education, the gap narrows to 6 percent (with the remaining "unexplained" gap due to other factors not directly examined in the study, such as quality of education, geographic variation, and discriminatory employment practices). Educational differences also explain much of the wage gap for foreign-born Hispanics.

- *Hispanics are greatly underrepresented in the high-paying IT sector, but in general those in IT occupations are successful.* While Hispanics are 11 percent of employed workers, they are only 4 percent of workers in 5 IT occupations. This Hispanic "digital divide" exists because the relatively low educational level of many Hispanics hinders entry into the IT labor market. This under-representation contributes to the economy-wide Hispanic pay gap because these IT jobs pay considerably more than other jobs. Non-Hispanic whites earn 62 percent more in IT than non-Hispanic whites in other occupations, and Hispanics earn twice as much in IT as

in non-IT occupations. Hispanics who are in IT occupations earn only marginally less (about 6 to 8 percent) than non-Hispanic whites after adjusting for differences in age, gender, and education.

- *The IT case study illustrates that the consequences of underachievement in education are two-fold: The students' future prosperity is harmed, and the economy at large will have fewer individuals prepared to contribute in "new economy" occupations.* Individuals' economic success in today's economy increasingly depends on being well educated. In turn, the strong performance of the American economy is propelled by the ingenuity and skills of our labor force, exemplified by new economy sectors like IT. Given the rapid growth of the U.S. Hispanic population, the gap in educational achievement between Hispanics and their peers is a matter of critical importance for Hispanic young people and society generally.

1. INTRODUCTION

Hispanics are an extraordinarily vibrant, rapidly growing segment of the American population. The Census Bureau projects that in 20 years, approximately 1 in 6 U.S. residents will be of Hispanic origin, and by the middle of the century, about one quarter of the population will be Hispanic. Clearly, Hispanic Americans will play an increasingly important role in American life. In particular, the success of the American economy over the coming decades depends to a considerable degree on the productivity of a labor force in which Hispanics will play a progressively larger role.

In this light, enhancing the current state of Hispanic education in the United States must be viewed as a public policy priority. While Hispanic student achievement and educational attainment have shown some progress over the past decades, troubling gaps remain. Hispanics lag behind non-Hispanics on a variety of educational measures. A much smaller proportion of the Hispanic population than the non-Hispanic population completes high school. Similarly, college entrance and completion rates are much lower among Hispanics than among non-Hispanic whites.

These educational achievement gaps are especially troubling in a labor market in which the economic rewards of education are large and increasing. Evidence suggests that demand has increased for workers who bring strong problem-solving ability and technical skills to the workplace. Statistics presented below verify that the economic rewards of education are much the same for Hispanics as for non-Hispanics. Those who fall behind in educational achievement will also lag in terms of economic success in the new economy.

To highlight these issues, this report focuses on one rapidly expanding, highly paid sector of the economy—information technology (IT). An examination of labor market data indicates that the generally well-educated Hispanics who attain positions in IT occupations earn twice as much as Hispanics in other occupations. Further, Hispanics in IT earn only slightly less than non-Hispanic whites with similar demographic characteristics and education. However, there is a significant "digital divide" in IT employment stemming from a dramatic underrepresentation of Hispanics in IT occupations. This underrepresentation appears in large measure to be the result of educational differences between Hispanics and non-Hispanics. While Hispanic students who attend college are as likely as other students to major in science and engineering, Hispanics are much less likely than others to attend college.

The IT case study illustrates that the consequences of underachievement in education are two-fold. Underachievement not only hurts the future prosperity of students themselves, but also reduces the number of individuals in the U.S. labor market prepared to contribute in new economy occupations. Individuals' economic success in the modern economy depends on their being well educated. In turn the performance of the American economy is strong in part because of the ingenuity and skills of our labor force, especially in new economy sectors like IT. In light of the rapid growth of the U.S. Hispanic population, the gap in educational achievement between Hispanics and their peers is a matter of critical importance for Hispanic young people themselves and also to society more generally.

2. A Brief Overview of Trends in Hispanic Education

Over the past 5 decades there has been a marked increase in the educational attainment of young Americans. Recent data indicate that high school completion rates for young adults (aged 25-29) are approximately 88 percent for both whites and African Americans, with the earlier pronounced differences between the races disappearing by 1998 (Chart 1).[1] Hispanics, however, have not experienced the same gains. The proportion of those aged 25-29 completing high school remains relatively low—about 63 percent in 1998—and, though data are unavailable for this series on Hispanics prior to 1974, there has been little growth in high school graduation rates since that time.

Chart 1. High School Completion Rates of 25- to 29-Year-Olds by Race and Ethnicity

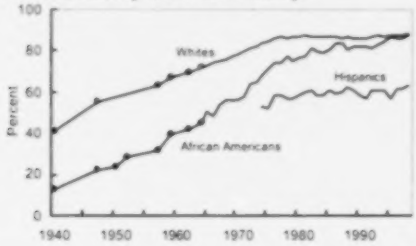
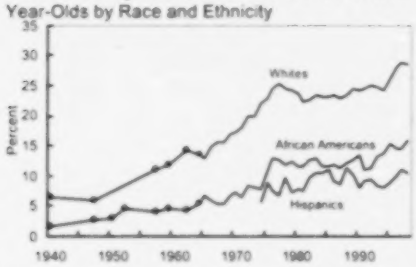


Chart 2. College Completion Rates of 25- to 29-Year-Olds by Race and Ethnicity



Similarly, as demonstrated in Chart 2, the college completion rate for Hispanics have lagged behind those of whites and African Americans. For whites the college completion rate—the fraction earning bachelor's degrees—rose significantly, from 6 percent in 1940 to 28 percent in 1998. Despite some progress, racial and ethnic gaps in college graduation rates remain large. Currently, only 10 percent of Hispanic adults aged 25-29 have graduated from college.

One major reason for the lower levels of education for Hispanics relative to non-Hispanics is that new immigrants are much less educated.[2] If we look only at Hispanics born in the United States ("native-born"), there has been clear growth in educational attainment. Census data from 1970, 1980, and 1990 indicate that among working-age adults, native- and foreign-born Hispanics trail native-born whites in average educational levels (see Table 1 on the next page). However, the education gap between whites and native-born Hispanics has been narrowing. In contrast, the gap in average education between whites and immigrant Hispanics has become wider. Measures of educational achievement for Hispanics such as those given in Charts 1 and 2 combine the relatively less educated immigrant Hispanic group with those born in the United States.[3]

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[1] Charts 1 and 2 are based on Census data, which include both Hispanic and non-Hispanic whites among "whites" and similarly has some Hispanics included in the African American group. The gaps between Hispanics and non-Hispanics are thus even larger than those pictured. Prior to the mid-1960s annual data are not available (the dots in the charts indicate points for which data are available).

[2] As of 1997, 38 percent of the Hispanic population were foreign-born, compared with 8 percent of whites and 6 percent of African Americans.

[3] For additional analysis see Julian R. Betts and Magnus Lofstrom, "The Educational Attainment of Immigrants: Trends and Implications," National Bureau of Economic Research Working Paper 6757, October 1998.

Table 1. Average Years of Education for Individuals Aged 16-64

	1970	1980	1990
Men			
Native White	11.6	12.7	12.9
Native Hispanic	9.5	10.9	11.4
Immigrant Hispanic	8.8	9.1	8.9
Women			
Native White	11.5	12.4	12.8
Native Hispanic	9.2	10.5	11.3
Immigrant Hispanic	8.4	9.0	9.1

Source: Betts and Lofstrom (1998), based on data from the U.S. Census.

While the educational attainment of U.S.-born Hispanics has been increasing over time, U.S.-born Hispanics continue to have lower school completion rates than do non-Hispanic whites. The average high school completion rate for 25- to 29-year-olds stood at about 80 percent for the 1995-1999 period, compared with a rate of 93 percent for non-Hispanic whites (Chart 3).[4] In contrast, the completion rate for foreign-born Hispanics averages below 50 percent. Data on dropout rates for those aged 16-24—the fraction of individuals who are neither enrolled in high school nor have completed high school—show similar patterns. The dropout rate (in Chart 4) is especially high for foreign-born Hispanics ("first generation immigrants") and for native-born Hispanic youth who had at least one parent born outside the United States ("second generation immigrants").[5] However, even for Hispanics who were born in the United States and whose parents were also born in the United States ("third generation" or higher), the dropout rate was approximately twice as high for Hispanics as for non-Hispanic whites—15.8 percent vs. 7.7 percent. Clearly the Hispanic education gap is not solely the consequence of relatively low educational attainment among immigrant Hispanics. A central challenge for improving Hispanic educational outcomes, then, lies in improving the educational prospects of both immigrant and native-born Hispanic youth.

Chart 3. High School Completion Rates 1995-1999, Aged 25-29

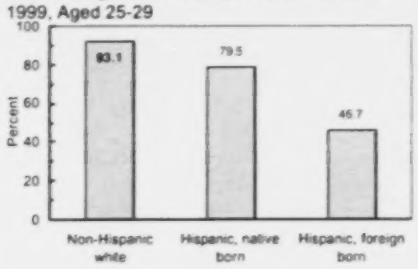
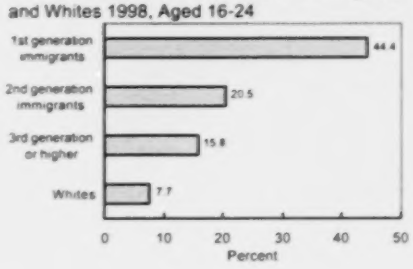


Chart 4. Dropout Rates for Hispanic Immigrants and Whites 1998, Aged 16-24



[4] This completion rate of 93 percent for non-Hispanic whites is higher than the 88 percent completion rate reported in Chart 1 which is for whites generally (including Hispanic whites). This analysis uses the Current Population Survey (CPS) for 1995 through 1999. Consistent with the definition used by the Census Bureau, this analysis (as well as all other original analysis conducted for this report) defines individuals as "native born" if they were born in the United States or an outlying area of the United States, or were born in a foreign country but had at least one parent born in the United States.

[5] Phillip Kaufman, et al., "Dropout Rates in the United States: 1998," U.S. Department of Education, National Center for Education Statistics, November 1999. Their analysis compares those born in the 50 states and the District of Columbia to those born elsewhere.

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3. THE PATH TO HIGHER EDUCATIONAL ATTAINMENT

Early education in the home and at school appears to be critical to successfully following a path towards higher educational attainment. Evidence suggests that the ethnic education gap can arise from learning differences at very young ages. One report using 1999 data indicates that among 3- to 5-year-olds not yet enrolled in kindergarten, Hispanic children were less likely than non-Hispanic children to regularly engage in such "home literacy" activities as being read to, told a story, or taught letters, words, or numbers. These home literacy activities in turn were found generally to be associated with higher levels of "children's emerging literacy." That is, the Hispanic children in the study were less likely to recognize all letters, count to 20 or higher, write their names, or read or pretend to read storybooks.[6] Statistics also indicate that Hispanic 3- and 4-year-olds are less likely than their white counterparts to be enrolled in early childhood education programs, and are underrepresented in Head Start enrollment.

At older ages, Hispanics on average trail non-Hispanic whites in reading and mathematics proficiency (at ages 9, 13, and 17, as measured by the National Assessment of Educational Progress).[7] Not surprisingly then, Hispanics on average also score lower than non-Hispanic whites on college entrance exams. This latter difference can be traced in part to family background. Hispanic students who take the Scholastic Aptitude Test (SAT) are much less likely than non-Hispanic whites to have a parent with a college degree, who might be in a better position to assist a child in the college-preparation process.[8] Hispanic SAT takers are also less likely than their non-Hispanic counterparts to have taken the Preliminary SAT (PSAT).[9]

Careful research shows that much of the disparity between the educational attainments of Hispanics and non-Hispanic whites stems from large differences in family background and income.[10] One study found that by age 15, 44 percent of Hispanic children had fallen one or two years behind the expected grade level—apparently because these students started school at older ages or were not advanced along with other children in their elementary school classes. Only about half as many non-Hispanic white children (23 percent) had fallen behind their expected grade level. Statistical analysis indicates that much of this educational gap can be explained by differences in family background characteristics, such as household income and parents' education. Furthermore, future prospects of completing high school and going on to college are greatly diminished for children who fall behind by age 15. For students who were 2 years behind the expected grade level, 67 percent of Hispanics and 80 percent of non-Hispanic whites failed to

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[6] See Christine Winquist Nord, et al., "Home Literacy Activities and Signs of Children's Emerging Literacy: 1993 and 1999," U.S. Department of Education, National Center for Education Statistics, 2000.

[7] From the early 1980s to present there has been improvement on these scores for all age groups of Hispanics, although only slightly for reading.

[8] About one third of Hispanic SAT takers have a parent with a college education, compared with more than half of non-Hispanic whites. See the National Science Foundation, *Women, Minorities, and Persons with Disabilities in Science and Engineering: 1998*, 1999.

[9] Statistics also indicate that for Hispanic groups as well as for other racial and ethnic groups, performance on the American College Test (ACT) is clearly correlated with family income. (National Science Foundation, *Women, Minorities, and Persons with Disabilities in Science and Engineering: 1998*, 1999.) These findings are relevant for Hispanic families in particular because family incomes are far lower for Hispanic households than non-Hispanic white households.

[10] The research reported in this paragraph is from Stephen V. Cameron and James J. Heckman, "The Dynamics of Educational Attainment for Blacks, Hispanics, and Whites," National Bureau of Economic Research working paper 7249, July 1999. The authors emphasize the role that economic background plays on children's educational achievement.

complete high school or earn a GED by age 24. Virtually none of these students (1 percent of Hispanics and 2 percent of non-Hispanic whites) had attended college by age 24. Thus, a disparity in educational outcomes appears among young children—long before they reach the ages when they are making decisions about completing high school and continuing on to college.

This evidence indicates that the ethnic disparities in high school completion and college attendance stem in large measure from a lifetime of disadvantage. The existing disparities must be addressed among disadvantaged students well before they reach the ages at which they are most likely to drop out of high school.

While evidence suggests that children from low-income families are less likely to be college-ready (by failing to earn a high school degree or otherwise failing to acquire skills or prepare to attend college), researchers also argue that low family income can be an important direct determinant of college attendance.[11] The high cost of college education can pose a serious deterrent. As indicated in Table 2, high-income families are much more likely than low-income families to send their children to college, and they are particularly likely to send them to four-year colleges.[12] The vast majority (90 percent) of students whose parents were in the top quartile of the income distribution were pursuing post-secondary education within 20 months of high school graduation, compared with only 60 percent of students whose parents were in the bottom quartile. And of those lower income students enrolling in post-secondary education, fewer than half enrolled in a 4-year college, compared with almost three-quarters of students from the top income group. Much of these differences in youths' college attendance may arise from the differences in preparedness for college just discussed, rather than from financial barriers. However, even after considering such family background influences, parental income remains an important determinant of college attendance.

Table 2. Percentage of Students from Families in Each Income Quartile Enrolling in Post-Secondary Schools within 20 Months of High School Graduation

Parental Income Quartile	Total	Vocational, Technical	2-Year College	4-Year College
Top	90	5	19	66
Second	79	6	25	48
Third	70	7	25	38
Bottom	60	10	22	28

Source: Kane (1999), based on data from the high school class of 1992.

Young people, their families, and the broader community continue to face the challenge of finding ways to insure that more disadvantaged young people complete high school and have college access. This must include improving educational prospects for disadvantaged children at every level, and insuring that financial barriers do not prove to be an obstacle at the college level.

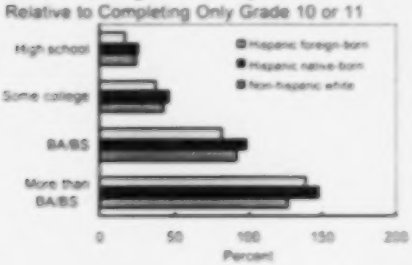
[11] As of 1998 median income for Hispanics was $28,330 compared with $42,439 for non-Hispanic whites. Data from the 1993 Survey of Income and Program Participation suggest that the median net worth of non-Hispanic white households was over 10 times that of Hispanic households. The 1998 *Economic Report of the President* provides a detailed overview of racial and ethnic disparity in income and assets.

[12] Thomas J. Kane, "Rethinking the Way Americans Pay for College," *The Milken Institute Review*, Third Quarter 1999.

4. The Importance of Education for Economic Success

On average, higher levels of education lead to better labor market outcomes—to higher rates of employment, lower rates of unemployment, and higher wages. And the wage premium associated with education has risen over time. In 1999, Hispanic men with a college degree earned 146 percent more than Hispanic men who had not completed high school. In contrast, in 1979 this same premium was a much smaller 67 percent for college completion. (Over the same period the premium for college education for all men in the work force rose similarly, from 57 percent to 147 percent.) The increasing premium appears to stem from the increasing value that the market places on technology-intensive skills, including computer skills that are used in service sector jobs. The wage premium for completing high school relative to dropping out has also risen over time for Hispanic men, increasing from 33 percent in 1979 to 40 percent in 1999. Recent research suggests that employers seeking to hire high-school educated individuals are looking for those with strong cognitive skills (including mastery of basic reading, math, and problem-solving skills). This preference for cognitive rather than manual skills might account for the rising pay premium for high school education.

Chart 5. Earnings Premium by Education Relative to Completing Only Grade 10 or 11



The raw comparisons in wages across education level described above do not take account of any differences in age structure or gender between workers in these groups. Chart 5 demonstrates that after controlling for age and gender, the premium for education is even higher for U.S.-born Hispanics than for non-Hispanic whites.[13] The earnings premiums, which show the percent increase in earnings for specific educational levels relative to those who drop out of high school after receiving 10 or more years of education, are given separately for non-Hispanic whites, native-born Hispanics and foreign-born Hispanics.[14] The general relationship between educational attainment and labor market success clearly holds for both Hispanics and non-Hispanics whites.[15]

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[13] Specifically, these results are based on regression models estimated for each ethnic/nativity group using a pooled sample of the 1995 through March 2000 monthly data from the CPS (with respondents in 1995-1998 included only in their last survey months and respondents in 2000 included only in their fourth survey month). The dependent variable is the log of individuals' per hour earnings, and explanatory variables are gender, age (included as indicator variables for 5-year age groupings), and educational category (less than grade 10, an omitted category of grade 10 or more but no high school diploma, high school, some college, BA or BS, graduate education). The analysis focuses on full-time workers aged 20 or older who are not self-employed. Earnings are converted to December 1999 dollars using the monthly CPI-U. Sample sizes are 262,843 non-Hispanic whites and 30,650 Hispanics (just over half of whom are foreign-born). Median regression is used, which allows one safely to ignore earnings top-coding of the CPS data. Coefficients reported in Chart 5 are for educational levels of high school and above. They are transformed to represent percent changes in hourly earnings.

[14] The "earnings premiums" reported in Chart 5 reflect in part the causal effect of education on workers' earnings (e.g., the increased earnings due to the higher productivity of workers in the labor markets). In principle, these numbers may also reflect that on average workers who attain higher education may also have valued unobserved characteristics (such as inherent cognitive ability or personal drive) that differ from those with lower levels of education. Evidence suggests that the premiums reported in ordinary regression analysis are reasonably good measures of the causal effects of education on earnings. (See

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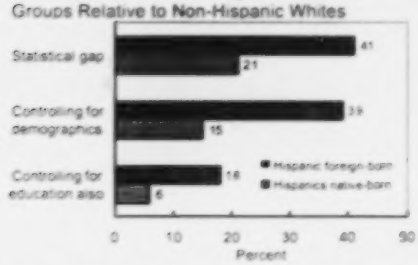
Since Hispanics have returns to education that are at least as great as those of non-Hispanic whites, the generally lower wages earned by Hispanics arise in large part from their lower levels of education. Specifically, over the last half of the 1990s, median hourly earnings of Hispanics were one-third less than those of non-Hispanic whites. Native-born Hispanics earned 21 percent less than whites, while foreign-born Hispanics earned 41 percent less (Chart 6). Part of these wage gaps are due to differences in gender and age composition; after adjusting for these demographic factors the gap is 15 percent for native-born Hispanics and 39 percent for foreign-born Hispanics. After controlling for available measures of educational attainment, the gap declines further to 6 percent for native-born Hispanics and 18 percent for foreign-born Hispanics. Part of the remaining "unexplained gaps" may be the consequence of differences in the quality and type of education at measured levels (for example, if non-Hispanic whites typically live in communities with higher quality public high schools than Hispanics, or if immigrants educated abroad received relatively lower quality education). Additionally, these gaps may reflect differences in language ability, variations in regional labor markets, and any wage differentials arising because of discriminatory employment practices. (Among foreign-born Hispanics the differential might also stem in part from the inclusion of illegal immigrants.) The central conclusion, though, is that for native-born and immigrant Hispanics alike earnings disparities are due in substantial measure to differences in educational attainment.[16]

Chart 6. Differences in Wages of Hispanic Groups Relative to Non-Hispanic Whites



5. Education and Earnings: A Case Study of the IT Sector

By most accounts the U.S. economy is experiencing a technological transformation that has changed the nature of work and placed a premium on a new set of skills. While this transformation has affected many jobs in the economy, there is a core set of occupations at the forefront of the revolution—occupations in information technology (IT). In the last 10 years, firms' expenditure on IT surged to become one of the largest components of investment. And employers appear increasingly to need workers with the problem-solving skills and technical expertise necessary to efficiently utilize these new IT investments.

David Card, "The Causal Effect of Education on Earnings," in *Handbook of Labor Economics*, volume 3, edited by Orley Ashenfelter and David Card, North-Holland, 1999.)

[15] For all of the analysis using the CPS it is useful to note that some differences between native-born and foreign-born Hispanics may stem from the inclusion in the CPS data of illegal immigrants, many of whom are presumably in a poor position to compete for good jobs in the United States. For a discussion about the presence of illegal immigrants in the CPS data, see Guillermina Jasso, et al., "The New Immigrant Survey Pilot (NIS-P): Overview and New Findings About U.S. Legal Immigrants at Admission," *Demography*, February 2000.

[16] The results about the importance of education for explaining the ethnic wage gap are consistent with recent research indicating that three-quarters of the wage gap between Mexican Americans and non-Hispanic whites is attributable to Mexican Americans' relative youth, English language deficiencies, and especially their lower educational attainment (Steven J. Trejo, "Why Do Mexican Americans Earn Low Wages?" *Journal of Political Economy*, 1997).

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This section examines the role of Hispanic Americans in IT. The analysis provides a vivid case study of the general problem of low educational attainment for Hispanic Americans, and the importance of closing the educational gap.

Although there is no exact definition of an IT worker, there are a number of occupations that quite clearly fall into the general domain of IT.[17] The analysis in this report considers a number of core IT occupations for which data are available from the Current Population Survey (CPS), a large nationally representative sample with information on workers' weekly earnings, demographic characteristics, and occupation. These core IT occupations are:

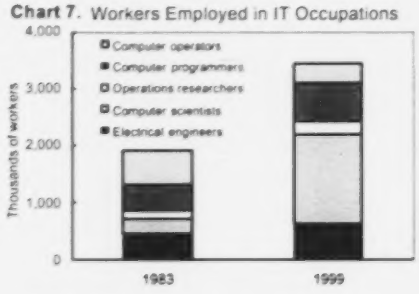
- electrical and electronic engineers;
- computer systems analysts and scientists;
- operations and systems researchers and analysts;
- computer programmers; and
- computer operators.

Definitions of these occupations are provided in the Appendix.

IT Occupations: Rapid Growth and High Wages

The combined employment level in these five occupations has grown by almost 81 percent since 1983 (Chart 7), with particularly strong growth in the last 5 years. In contrast, total employment in the overall economy grew by just 32 percent since 1983. Today these IT occupations comprise approximately 3.4 million workers (about 2.6 percent of all employed workers). Employment projections by the Bureau of Labor Statistics suggest that rapid growth for computer-related occupations is expected to continue well into this century.

Chart 7. Workers Employed in IT Occupations



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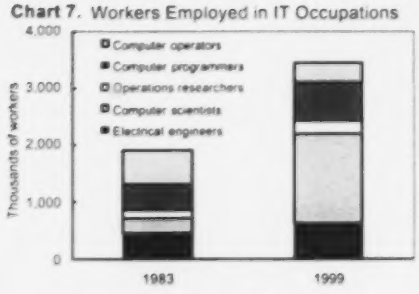

Within specific occupations, the most notable feature is the strong and steady growth of computer systems analysts and scientists. In 1983, this occupation had just over a quarter of a million workers, or 14 percent of the total IT workforce. By 1999, there were 1.5 million workers in this occupation, or 45 percent of the total. Also notable is the decline in the number of computer operators, perhaps stemming from changes in computing technology.

In addition to experiencing high employment growth, these occupations are also characterized by high wages (Chart 8). Median weekly earnings for four of the five IT occupations—all but computer operators—easily

[17] For a further discussion of these and related issues see Carol Ann Meares et al., "The Digital Workforce: Building Infotech Skills at the Speed of Innovation," U.S. Department of Commerce, Office of Technology Policy, June 1999.

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exceeded median weekly earnings for all workers in 1999 as well as in 1989. The median earnings for the highest-paid IT occupation—electrical and electronic engineers—was almost twice that of all workers ($1,073 vs. $549 in 1999).

Hispanics in IT Occupations

As in many other higher-paid occupations, Hispanic Americans are severely underrepresented in IT. There is some indication that this underrepresentation has improved modestly over the last decade.[18] Nonetheless, an examination of data from the CPS shows that over the late 1990s (1995 to the most recent available data, March 2000), Hispanics represented 11 percent of all employed workers, but only 4.1 percent of the workforce in these five IT occupations.

The underrepresentation of Hispanics in IT contributes to the ethnic economic gap because Hispanics and non-Hispanics alike earned far more in IT than in other occupations. Median hourly earnings for non-Hispanic whites in IT were 62 percent higher than for non-Hispanic whites in non-IT occupations, and Hispanics earned twice as much in IT as in other occupations. Moreover, evidence suggests that Hispanics in IT earned only modestly less than similar non-Hispanic whites: In an analysis of earnings that accounts for differences in education, age and gender, native-born Hispanics earn about 6 percent less than non-Hispanic whites. And foreign-born Hispanics earn an additional 2 percentage points less than native-born Hispanics (a difference that is not statistically significant).[19] The "unexplained" pay gap of 6 percent is comparable to the 6 percent gap that emerges in the general labor market for native-born Hispanics when controlling for demographics and education.

The general conclusions about Hispanics in IT—that Hispanics earn only slightly less than non-Hispanics but are greatly underrepresented in IT—are reinforced when a somewhat broader set of science and technology occupations is examined.[20] In this expanded sample an analysis that controls for age, gender, and education indicates that native-born Hispanics earn

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[18] This conclusion comes from comparing average representation of Hispanics in IT occupations in 1987-89 with 1997-99 (using various issues of *Employment and Earnings* from the Bureau of Labor Statistics). There were increases in Hispanic representation in four of the occupations—computer operators (up 1.1 percentage points to 7.1 percent), computer programmers (up 1.2 percentage points to 4.4 percent), computer scientists (up 1.0 percentage points to 3.6 percent), and electrical engineers (up 1.5 percentage points to 3.9 percent). There was a decline in Hispanic representation for operations researchers (a 0.8 percentage point drop to 3.4 percent).

[19] This is based on a regression model estimated using a pooled sample of the 1995 through March 2000 monthly CPS data, with a dependent variable log of individuals' per hour earnings, and explanatory variables, gender, age category, Hispanic and foreign-born Hispanic indicators, and educational category (less than high school, high school, some college, associate degree, BA or BS, and graduate education). The analysis focuses on full-time workers aged 20 or older who are not self-employed. Earnings are converted to December 1999 dollars using the monthly CPI-U. The sample includes Hispanics and non-Hispanic whites. The sample has 8,469 individuals, including 355 Hispanics. Median regression was used. The coefficient for the "Hispanic" indicator was significantly different from zero (t-statistic of –2.0), and "foreign-born Hispanic" was not (t-statistic of –0.5).

[20] This broader set includes the 5 IT occupations and also engineers of all types (aerospace, metallurgical and materials, mining, petroleum, chemical, nuclear, civil, agricultural, industrial, mechanical, marine and naval architects), mathematical scientists (including actuaries and statisticians), natural scientists (physicists and astronomers, chemists, atmospheric and space scientists, geologists and geodesists, physical scientists, agricultural and food scientists, biological and life scientists, forestry and conservation scientists, and medical scientists), and technicians of all sorts (electrical and electronic, industrial engineering, mechanical engineering, engineering, biological, chemical, and science technicians).

about 4 percent less than non-Hispanic whites, while foreign-born Hispanics earn an additional 2 percentage points less than native-born Hispanics (earnings differences that are not statistically significant).[21] However, a large gap exists in Hispanic employment: Hispanics are 11 percent of all employed workers but only 4.3 percent of workers in these science and technology occupations.

As detailed in a 1999 Office of Technology Policy report, the lack of Hispanic workers in these high-paid and rapidly-growing occupations stems from disparities in education that exist among young people prior to entering the labor force.[22] In particular, the report indicates that as of 1996 Hispanic college students earned bachelor's degrees in science and engineering at the same rate as whites (33 percent of students major in science or engineering). And rates are comparable also in engineering specifically (5.3 percent for Hispanics and 4.9 percent for whites) and computer science (1.8 percent for Hispanics and 1.7 percent for whites). The shortage of Hispanics in new economy jobs is not the consequence of Hispanic college students shying away from technical fields. Instead, the key to increasing Hispanic representation in science and engineering appears to be identifying and implementing strategies to increase the overall pool of Hispanic undergraduates.

6. Concluding Remarks

In light of the rapid growth of the U.S. Hispanic population, the gap in educational achievement between Hispanics and their peers is a matter of critical policy importance. This report emphasizes a number of salient facts on this issue. First, there is a large gap between the education of Hispanics and non-Hispanic. The ethnic education gap stems in part from the comparatively low levels of education among immigrant Hispanics. However, while there has been improvement in the educational achievement of native-born Hispanics, much of the gap is the consequence of poor educational outcomes among native-born Hispanics. Closing the education gap will require improved educational outcomes for immigrant and non-immigrant Hispanics alike. Second, this ethnic gap in education is a strong contributing factor to a corresponding gap in economic outcomes. Hispanics earn substantially less than non-Hispanic whites, in large measure because of the education gap. As a key example, the education gap contributes to a serious "digital divide" in employment in IT occupations and other science and technology jobs. Hispanics who work in these occupations generally have high earnings—only moderately less (4 to 8 percent) than similar non-Hispanic whites. However, Hispanics are severely underrepresented in these new economy occupations in part because relatively few Hispanics achieve the necessary educational levels. Underachievement in education hurts the future prosperity of the students themselves and also reduces the number of workers in the labor force prepared to contribute in new economy jobs.

Research described in this report suggests that the relatively poor educational outcomes of Hispanic youth often stem from a lifetime of disadvantage. The solution to the education gap lies in finding and implementing initiatives that not only target students at the ages when they are making decisions about completing high school and continuing on to college, but that also focus

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[21] The sample is 718 Hispanics and 16,495 non-Hispanic whites. The coefficient for "Hispanic" is not significant (t-statistic of –1.6) nor is the coefficient for "foreign-born Hispanic" (t-statistic of –0.6).

[22] "The Digital Work Force: Building Infotech Skills at the Speed of Innovation," U.S. Department of Commerce, Office of Technology Policy, June 1999. This report also highlights that women generally are underrepresented in IT occupations. In contrast to racial and ethnic minorities, women are under-represented because they are less likely to choose science and engineering fields when in college.

on children earlier in the educational process. In short, the education gap must be addressed at all age levels. The accompanying box lists some of the ways in which the federal government is seeking to improve educational outcomes for U.S. youth—programs that indeed focus on all educational levels. If the ethnic education gap is to be narrowed substantially and rapidly, major efforts will be required from families and communities, and from the private and public sectors at all levels.

Examples of Federal Government Efforts to Improve Educational Opportunity.

Research indicates that the early preschool years, when human ability and motivation are being shaped, are critical to skill formation. Developmental programs that intervene early in life have been shown to be more cost-effective than later attempts at remediation. One such program is the federally funded Head Start program, which, since 1965, has provided comprehensive developmental services for low-income preschool children as well as social services for their families. This program has been shown to have large positive effects on test scores and schooling attainment for Hispanic children specifically. (See Janet Currie and Duncan Thomas, "Does Head Start Help Hispanic Children?" National Bureau of Economic Research, working paper 5805, 1996.) The success of Head Start has prompted the Administration to nearly double funding for the program since 1993 and to seek a $1 billion (19 percent) increase in funding for the program as part of the fiscal 2001 budget.

As part of their agenda to improve public education, President Clinton and Vice President Gore have insisted on high standards for all students; demanded accountability for results; and expanded investment in strategies aimed at raising student achievement. The Clinton-Gore education agenda has focused on reducing class size in the early grades, expanding after-school and summer-school opportunities, ensuring access to educational technology, improving teacher quality, and expanding public school choice. (The 2000 *Economic Report of the President* details federal initiatives targeting each of these agenda items.) As part of the Hispanic Education Action Plan, the Administration has requested funding in the fiscal 2001 budget for programs that will improve the education of Hispanic students, including Title I grants to local educational agencies, bilingual education, migrant education, an adult English literacy initiative, and programs to help students prepare for and complete college.

Finally, the federal government has a number of programs to aid students in preparing for post-secondary education and to help make college affordable. GEAR UP partnerships of middle schools, colleges, and community organizations provide low-income students with mentoring, tutoring, and information on financial aid, starting no later than 7th grade. Another example is the TRIO programs—educational outreach programs designed to motivate and support students from low-income families. Other examples include programs that provide financially needy students with assistance, most prominently the $4.9 billion Hope Scholarship, $2.4 billion Lifelong Learning tax credits, and $7.6 billion provided in the 2000 budget for Pell grants.

APPENDIX. DESCRIPTIONS OF IT OCCUPATIONS STUDIED IN THIS REPORT

Electrical and Electronic Engineers design, develop, test, and supervise the manufacturing of electrical and electronic equipment. These engineers specialize in different areas such as power generation, transmission, and distribution; communications; computer electronics; and electrical equipment manufacturing — or a subdivision of these areas. They design new products, write performance requirements, and develop maintenance schedules. They also test equipment, solve operating problems, and estimate the time and cost of engineering projects.

Computer Systems Analysts, Engineers, and Scientists is a category which includes a wide range of computer-related occupations. Systems analysts solve computer problems and enable computer technology to meet the individual needs of an organization. Computer engineers work with hardware and software aspects of systems design and development. Computer scientists include a wide range of computer professionals who design computers and the software that runs them, develop information technologies, and develop and adapt principles for applying computers to new uses.

Operations Researchers and Analysts conduct research and perform analyses to support management in increasing the performance of an organization. Managers begin the process by presenting the symptoms of an operations-related problem to the analyst, who then formally defines the problem and selects the most appropriate analytical technique to examine it. Upon completion of the analysis, the analyst presents management with recommendations based on the results of the analysis.

Computer Programmers write, test, and maintain the detailed instructions, called programs or software, that computers must follow to perform their functions. In many larger organizations, programmers follow descriptions that have been prepared by software engineers or systems analysts. The transition from mainframe to personal computers has blurred the once rigid distinction between the programmer and the user. Increasingly, adept users are taking over many of the tasks previously performed by programmers, such as writing simple programs to assess data or perform calculations.

Computer Operators oversee the operation of computer hardware systems to ensure that they are being used most efficiently. These systems include mainframes, minicomputers, or networks of personal computers. Computer operators must anticipate problems and take preventative action, as well as solve problems that occur during operations. Increased automation and other technological advances are shifting the responsibilities of many computer operators to areas such as network operations, user support, and database maintenance.

Source: Bureau of Labor Statistics, U.S. Department of Labor, *Occupational Outlook Handbook, 2000-01 Edition*, 2000.